



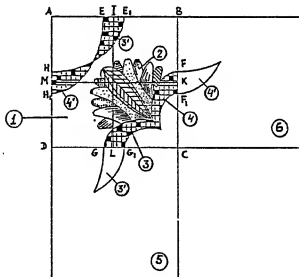
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(54) Title: A PARTITIONED FRAGMENT IN A CLOSED CONTOUR AND A METHOD OF FORMING A VARIETY OF DECORATED SURFACES

(57) Abstract

A unit (1) is described for use in a multi-unit decorative or structural arrangement. Each unit (1) has, on at least one surface, an asymmetrical design which may be two dimensional or three dimensional. These asymmetrical designs are arranged to permit a number of identical units (1) to be arranged together to form a large variety overall designs whose final form depends upon the relative positions of the individual units (1) within the arrangement. For example, a number of identical square tiles are provided, each having the same design and with the design created so that a tile wall can be formed from the identical tiles with hundreds of different overall designs. The same large number of overall designs may be formed from units other than square units (1) including three dimensional building blocks and similar basic decorative or constructive units.



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BACKGROUND OF THE INVENTION

The present invention relates to a method and means for decoration or construction using a number of identical units having a two or three dimensional design on one surface. More particularly, the invention relates to a method of forming identical designs on individual units so that a large number of overall designs may be obtained depending upon the particular orientation of the individual units within the overall surface or structure.

The units, which may be decorative tiles or plaques or building blocks or the like are characterized by having identical asymmetrical designs on one surface. The designs are laid out to permit the units to be assembled with a variety of positions in respect to one another in forming differing overall designs. When a decorated square unit is used, for example, the individual design chosen permits several hundred different overall decorative wall or other designs to be formed using only the one basic unit design.

This permits a standardization and a significant cost saving in the manufacture and supply of decoration and construction units. With only a single and easily produced design being used, hundreds of different, visually distinct, attractive composite arrangements may be obtained. One of the many examples of this invention would be its use on common square decorative tiles. Using a single tile design for forming a household tile surface, several hundred different wall designs would be available for apartment construction using only a single decorative unit tile. The principal, as will be more fully explained below, is applicable to many other construction or decorative uses where similar inexpensive and mass produced units may be employed in producing large numbers of completed assemblies of differing and customized appearances.

Accordingly, the object of the present invention is to provide an improved decoration or construction unit permitting individualized designs based upon the use of identical construction units.



Another object of the invention is to provide an improved decorative or construction element capable of producing a large number of differing assemblies from identical individual units.

Another object of the invention is to provide low cost customized decorated surfaces or structures at low cost.

Another object of the invention is to provide an improved method of forming a large variety of differing designs from identical individual units.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiments about to be described or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein:

FIG. 1 is a plan view of a design in accordance with the invention.

FIG. 2 is a plan view corresponding to FIG. 1 illustrating a step in the design of a decoration unit.

FIG. 3 is a diagrammatic illustration of the unit of FIG. 2 illustrating several positions in which the individual unit may be placed for combination with similar units in creating differing overall assemblies.

FIG. 4 is a diagrammatic view showing an assembly of square units illustrating a variety of unit placements.

FIG. 5 is a diagrammatic illustration of a hexagonal unit assembly illustrating possible variations.

FIG. 6 is a diagrammatic view illustrating rectangular units assembled in a variety of arrangements.



FIGS. 7 through 12 are plan views of unit arrangements each illustrating a differing design and all assembled from a number of tiles of the tile design of FIG. 2.

FIGS. 13 through 15 illustrate three related unit designs for use in the method of the invention including treatment of border or marginal areas.

FIG. 16 is a plan view of a unit arrangement utilizing the units of FIGS. 13 through 15 and showing a method for border or margin arrangement.

FIGS. 17 through 22 illustrate additional arrangements for non-square units.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The configuration of the individual unit i.e; its contour or design is such that a number of identical assembled units create a single decorated surface or a single three dimensional figure.

Both planar formations and three-dimensional formations may be used employing graphics, painting, sculpture, sculptural relief, mosaic, chiselling, casting, etc., and using various materials, both natural and synthetic including ceramic, glass, concrete, wood, plastics, fabrics, and others.

The products presently used by architects, in both exterior and interior decoration, are characterized by a diversity of stylistic peculiarities, textural differences, and varied materials.

These products are further normally characterized by one common property which is their use in only obtaining a completely uniform and constantly repeating surface pattern. The structure and character of the pattern of these products when assembled creates only one uniform composition with a particular repeating pattern.

In the past, covering the floor of a room for example, required a number of differently decorated elements from which the overall pattern of the floor of the particular room was put together. Contemporary mass production with its demand for



standardization and unification is not able, without an excessive increase of the cost of production, to produce articles having many differing patterns or drawings. When differing designs are required, it is done on an individual basis with a significant increase in expense for the design and manufacture.

The following is a description of a unit having the capacity for permitting the formation of a large number of differing decorative and artistic figurative compositions from identical mass produced units.

As a sample unit decoration, for descriptive purposes, a leaved flower 2 is used in a decorative shape which suggests wings (FIG. 1). In the square unit 1 illustrated and with the possibility of moving the design fragment in the plane of the unit, a position is selected for the leaved flower 2 at which its main part is moved into the right lower corner of the unit 1. The flower leaf 3 crosses the unit 1 side in the middle of side DC and the leaf 4 in the middle of the side BC (FIG. 2). Beyond the area of the main unit, there remains a part of 3' of the lower leaf 3 in the unit 5 while the cutoff part 4' of the upper leaf 4 remains in the unit 6, (FIG. 2). In order to maintain all three partitioned elements of the design in the limits of the main unit 1, additional changes are made. The unit 5 is moved upwards to the position where the unit 5 overlies the unit 1. Now the cutoff part of the leaf fragment 3' will be inside the main unit 1. A similar movement of the upper unit 6 so that it overlies the unit 1, moves the cutoff part 4' of the leaf 3 into the unit 1.

Thus within the border of the closed unit 1, we have all three elements of the leaved flower design. In this arrangement, the width of both leaves 3 and 4 at the position where they cross over the edges of the main unit 1 are equal, i.e; $FF' = GG'$, and the points K and L are the middle points of the sides BC and DC i.e; $HH' = EE'$, FF' , GG' , and the distances between the corners of the unit 1 and the leaf crossovers are equal, i.e; $AE = E'B = BF = F'C = CG' = GD = DH' = HA$.

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Thus, the significant features of the unit 1 are in the symmetry of the partitioned elements of the decorative flower relative to the square axes MK and IL and the center of the square unit and in the equal width of the leaves at their crossing points at the unit edge and in the symmetry of the points E and E' relative to the point I; points F and F' relative to point K; points G and G' relative to point L; and points H and H' relative to point M.

These features of the design of the partitioned fragments are the key to the new wide image possibilities inherent in the unit i.e; the possibility to produce from identical units a large number of various image combinations both by rhythm and composition.

The ability to form a large number of compositions from assemblies of the same unit follows from the fact that on the image plane, which consists of identical units, each unit can change its position while turning around its geometrical center for 90° , 190° , 270° and 360° (FIGS. 3 and 4). With each turn a new and different image composition is formed. With every new turn the partitioned elements of the unit form a new combination with other partitioned elements of the adjacent unit.

Should the units be shaped in the form of equilateral hexagons, each new shape is formed by turning the unit around its geometrical center of 60° , i.e; 120° , 180° , 240° , 300° and 360° (FIG. 5).

Should the unit be formed in the shape of a rectangle with side proportions of 1:2, each new composition is achieved by turning the unit for 180° or by turning a few units simultaneously (FIG. 6).

The same ability to form new image compositions is also available in three dimensional units having their structural designs similar to those of the plane units as described above.

In this case, with each new position change of the volumetric units in the image plane, the volumetric partitioned elements form a new combination with the volumetric partitioned elements of the adjacent units.



The joining of the adjacent units occurs at the cross-section of the relief in planes which are perpendicular to the unit plane.

It will be seen that these improved decorative or construction units offer practically unlimited possibilities for the manufacturing of new materials and products for the decorative and applied arts.

The units may be made from natural or synthetic materials manufactured by a variety of methods and material treatments and in a variety of colors and compositions with various surface treatments.

A great number of different artistic or decorative compositions can be created from the inexpensive identical units giving the possibility of creating almost unlimited numbers of different compositions. For example, from 20 identical units it is possible to create one billion different compositions.

In order to determine the total number of possible image compositions, we have to consider all the possible position changes for the units that form an image field, including the possible position change of each individual unit for 90° , 180° , 270° , 360° (see FIG. 30. This consideration also includes the possible position change of a few units simultaneously in any of its combinations with 2,3,4,5 etc. units forming the image field. Also other possible unit position changes where each unit can change its position with other units, i.e; one unit on a 90° , a second unit on 180° , a third on 270° , a fourth on 360° , a fifth on 180° (90° , 270° ...etc.), i.e; using all possible unit combinations and movements.

An example follows where all possible combinations of 2 units A and B can be observed.

unit	EACH UNIT TURN (IN DEGREE)															
A	90	90	90	90	180	180	180	180	270	270	270	270	360	360	360	360
B	90	180	270	360	90	180	270	360	90	180	270	360	90	180	270	360

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The total number of image combinations equals 16. Thus, if movements of one unit can form 4 combinations, then movements of 2 units can form 16 combinations, i.e.; $(4^2 = 16)$.

Using this method we can determine a number of possible overall design compositions for any number of units which form an image or design field according to the formula $S=4^n$, where n is the number of units that form an image field, and 4 corresponds to a number of possible changes for a unit of a square configuration.

For example, if we add a unit C in all its possible positions ($90^\circ, 180^\circ, 270^\circ, 360^\circ$) to the units A and B as shown above, then there will be 16 new combinations at $C-90^\circ$; 16 new combination at $C-180^\circ$; 16 new combinations at $C-270^\circ$, and 16 new combinations at $C-360^\circ$ (i.e.; all the image compositions that correspond to the formula $S=4^3=64$).

For the units that have the shape of an equilateral hexagon, this formula will be expressed $S=6^n$.

This means that the number of image or design compositions for the field that consists of 4 units will number $S=4^4$, i.e.; 256 (for a square); for 5 units $S=4^5$, i.e.; 1024, for 6 units $S=4^6$, i.e.; 4096, etc., so that 10 units will provide 1,048,576 possible overall designs.

FIGS. 7 through 12 illustrates a number of differing designs formed from an arrangement of identical units or tiles. The unit chosen for these illustrations is the unit of FIGS. 2 and 3. FIG. 7, for example, shows a particular design with the identical tiles fitted together so that an overall pattern comprising a diagonal garland effect is obtained with the garlands being diagonal rows of a floral-like design.

FIG. 8, which is formed of identical units or tiles differently arranged, shows diagonal garlands which alternate between a plain ribbon-like garland and a flower-like garland.

FIG. 9, also uses the same tiles rearranged to provide a diagonal floral or garland pattern with all of the diagonal members being identical.



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FIG. 10 shows a further differing design formed again from the same units or tiles with a regular pattern comprising a series of closed generally rectangular floral patterns.

FIG. 11 shows another one of the many design possibilities comprising discreet floral-like designs arranged in diagonal lines.

FIG. 12 illustrates a design using the same units or tiles which describe and comprise a winding garland pattern.

As described above in the discussion of the total number of designs available, numerous additional designs or patterns may be made. In certain of the designs in which larger patterns are employed and where each larger pattern is formed from a number of units or tiles, it may be desirable to have a slightly differing marginal or border treatment. For this purpose, slightly modified tiles may be used.

FIG. 13 illustrates a decorated unit in accordance with the invention of the general pattern already described, for example, in forming designs such as those illustrated in FIGS. 1 through 12. The unit of FIG. 14 includes only the design from the lower left corner of the FIG. 13 unit while the unit of FIG. 15 utilizes only design from the upper left hand corner. FIG. 16 shows these additional units providing marginal or completing portions for designs whose central portion will normally include a number of tiles of the form shown in FIG. 13.

As described above, units in the form of rectangles may also be used to carry out the decorating method of the invention. FIG. 17 illustrates a unit N in the form of a rectangle with its sides having a 1 to 2 relationship. This unit of FIG. 17 has a number of design forming fragments which reach the shorter sides at their mid-points and which reach the longer sides at two positions equally placed from the unit corners. This arrangement of the fragments of the design permits the units to be reassembled in a variety of relationships producing a large number of differing designs for the reasons already discussed. In the lower portion of FIG. 17 such a design is shown with a number of the units combined. In addition to the main unit N,



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additional units O and P are shown which include only a portion of the design. These units are useful in finishing off the edge portions of a larger pattern. The units O, for example, are shown finishing off the top of the design and the P units are shown completing the left hand margin of this design.

FIG. 18 illustrates the same basic units arranged in a differing pattern with the relative horizontal and vertical positions rearranged in a differing pattern with the N and O units again forming a margin.

FIG. 19 shows a further and differing design or arrangement using these same rectangular units.

FIGS. 20, 21 and 22 illustrate still further arrangements of the rectangular N units arranged in differing positions giving differing overall patterns.

Areas for use of these units include interior and exterior walls, facades, floor coverings, and a variety of other exposed surfaces or structures. The units may be in the form of bricks, blocks, wall paneling, tiles and other building materials. Also railings, tracery metal enclosures, balconies, fences, doors, window frames, parapets and other enclosing materials made from metal and manufactured by different methods of cold and hot metal treatment such as casting, chasing, pressing, carving, forging, bending, netting, welding, etc.

Also carpet may be designed in accordance with the invention to permit the formation of various decorative floor designs and to allow a change of the design periodically by interchanging the positions of separate unit carpets.

Also the invention may be used for games of differing degrees of complexity based on the forming of numbers of decorative, artistic compositions from a limited number of units including games with the application of poligraphic means, volumetric and applied games, mechanic games with image illuminations, etc.



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As various changes may be made in the form, construction and arrangement of the parts and steps herein without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in a limiting sense.



CLAIMS

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HAVING THUS DESCRIBED MY INVENTION, I CLAIM:

1. A unitary element for use with a plurality of similar elements in a decorative assembly:

said unitary element having an asymmetric design on at least one surface with portions of this design extending to the element edges for being combined with design portions or additional similar elements;

the said element portions of the asymmetrical design on the said one surface terminating at each of the edges being symmetrical with respect to the center of the edge.

2. The unitary element of claim 1 which is square and said element portions terminating at the center of the element sides.

3. The unitary element of claim 1 which is rectangular.

4. The unitary element of claim 1 which is hexagonal.

5. The unitary element of claim 1 in which the said portions extend to a plurality of positions on at least one edge with said positions being equally spaced for the said one edge center.

6. The unitary element as claimed in claim 1 in which said designs are two dimensional.

7. The unitary element as claimed in claim 1 in which said designs are three dimensional.

8. The unitary element as claimed in claim 1 in which said elements are square and said design portions engage each of the four edges at the edge center.

9. The unitary element as claimed in claim 1 in which said elements comprise structural members.

10. The unitary element as claimed in claim 1 in which said elements comprise decorative tiles.

11. The unitary element as claimed in claim 1 in which said elements comprise wood panels.

12. The unitary elements as claimed in claim 1 in which said elements comprise building bricks.

13. The unitary elements as claimed in claim 1 in which elements comprise carpet material.

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14. A unitary element for use with a plurality of similar elements in a decorative assembly:

said unitary element having an asymmetric design on at least one surface with portions of this design extending to the element edges for being combined with design portions or additional similar elements;

said designs being formed whereby all sides of one of said elements will match with all sides of a similar element with differing decorative assemblies resulting from the particular arrangement selected.

15. The unitary element of claim 14 where the number of arrangements available is at least equal to S^n where S equals the number of sides on the elements and n equals the number of elements in a unit arrangement.

16. The unitary element of claim 14 in which said designs are two dimensional.

17. The unitary element of claim 14 in which said designs are three dimensional.

18. The unitary element of claim 14 in which said element comprises a self-supporting member.

19. The unitary element of claim 14 in which said element comprises decorative tiles.

20. The unitary element of claim 14 in which said element comprises a brick member.

21. An improved method of forming a variety of decorated surfaces utilizing a plurality of similar units which are assembled to form the overall design comprising:

applying an asymmetric design to one surface of the unit; terminating a portion of said design at a unit edge; said portions being at the center of the edge of the said unit surface or equally spaced on opposite sides of the center of said edge.

22. The method as claimed in claim 21 which comprises the further step of arranging the units with differing orientations for the similar units in the decorated surface.



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23. The method as claimed in claim 21 which further comprises the step of terminating said portions at the center of each side of the unit.

24. The method as claimed in claim 21 which further comprises the step of terminating said portions at the center of a plurality of edges of the unit.

25. The method as claimed in claim 21 which further comprises the steps of terminating said portions at a plurality of edges and with a plurality of portions on each of said edges equally spaced from the edge centers.

26. The method as claimed in claim 21 in which said designs are applied as two dimensional designs.

27. The method as claimed in claim 21 in which said designs are applied as three dimensional designs.

AMENDED CLAIMS

(received by the International Bureau on 6 July 1979 (06.07.79))

1. A decorative unit comprising a unitary ornamental design divided into separate portions with said portions being positioned within the closed border of a rectangular base having sides of equal length or multiples thereof or a hexagonal base characterized in that all the portions of the design are asymmetrically disposed within the border of the unit with respect to the geometric center thereof, each portion having at least one edge of the same width meeting the unit border with the centers of said edges being positioned equidistantly from the border corners for squares and hexagons and having their centers spaced equidistantly from the corners on the short sides of rectangles and a similar distance apart on the longer sides of the rectangles, all of the portions having the same color characteristics and all of the portions being disposed within the unit border so that all of said portions combine with one another as identical units are joined to one another in all possible combinations to form a variety of clearly distinctive patterns characteristic of representational art.

2. The unit as set forth in claim 1, characterized in that less than all of the design portions are disposed within the closed border of the unit, whereby the unit is subdivided into a subunit sharing a common structure but differing in the pattern element portions whereby the subunits serve the function of imparting completeness to a decorative pattern as a whole.

3. A plurality of units as set forth in claim 1 characterized in that one or more of said units have less than all of the design portions disposed within the closed border.

4. A unit as set forth in claim 1 and being three-dimensional and further characterized in that a plurality of identical three-dimensional design portions provide a three-dimensional pattern.

5. A subunit as set forth in claim 2 and being three-dimensional and further characterized in that a plurality of three-dimensional design portions provide a three-dimensional pattern.

6. A unit as set forth in claim 4 in combination with a plurality of subunits having only a portion of the design portions disposed within the closed border.

7. A unit as claimed in claim 1 characterized in that it comprises materials chosen from the group consisting of ceramic, concrete, plastic, wood, fabric, glass and carpet.

8. A unit as claimed in claim 2 characterized in that it comprises material chosen from the group consisting of ceramic, concrete, plastic, wood, fabric, glass and carpet.

9. A unit as claimed in claim 1 further characterized in that it is combined with a plurality of similar said units into a mosaic pattern.

10. A subunit as claimed in claim 2 further characterized in that it is combined with a plurality of similar units into a mosaic pattern.

11. A unit as claimed in claim 1 characterized in that it is combined with a plurality of similar units in the form of a three-dimensional pattern.

12. A subunit as claimed in claim 2 characterized in that it is combined with a plurality of similar units in a form of a three-dimensional pattern.

13. A unit as claimed in claim 1 characterized in that it has structural properties for use as a structural element in a variety of structural materials.

14. A unit as claimed in claim 2 characterized in that it has structural properties for use as a structural element in a variety of structural materials.

15. A unit as claimed in claim 4 characterized in that it has structural properties for use as a structural element in a variety of structural materials.



16. A unit as claimed in claim 5 characterized in that it has structural properties for use as a structural element in a variety of structural materials.

17. A unit as claimed in claim 1 characterized in that it comprises a decorative glass.

18. A unit as claimed in claim 2 characterized in that it comprises decorative glass.

19. A game for forming a number of differing decorative compositions from a fixed number of units as claimed in claim 1.

20. A game for forming a number of differing decorative compositions from a fixed number of the units and subunits as claimed in claim 3.

21. A game for forming differing decorative compositions from a fixed number of units as claimed in claim 6.

22. A plurality of units as claimed in claim 3 comprising a mosaic.

23. A plurality of units as claimed in claim 3 comprising graphics.

24. A method of designing a decorative unit comprising dividing a unitary ornamental design into separate portions with said portions, positioning said portions within the closed border of a rectangular base having sides of equal length or multiples thereof or within a hexagonal base, disposing the portions of the design asymmetrically within the border of the unit with respect to the geometric center thereof, positioning the portions with edges of equal width meeting the unit border and with the centers of said edges being positioned equidistantly from the border corners for squares, rectangles, and hexagons and having their centers spaced equidistantly from the corners on the short sides of rectangles and a similar distance apart on the longer sides of the rectangles, coloring the portions with the same color characteristics, and

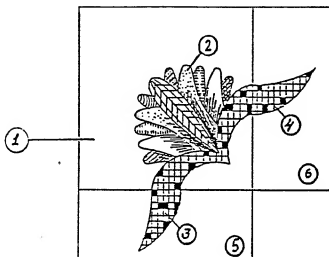
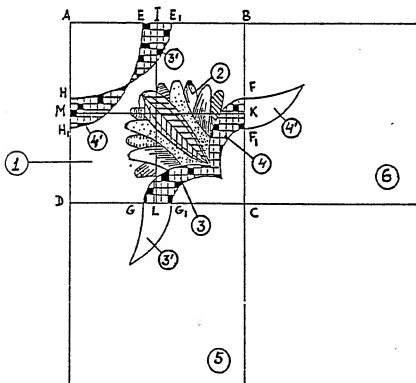


disposing the portions within the unit border so that all of said portions combine with one another as identical units are joined to one another in all possible combinations to form a variety of clearly distinctive patterns characteristic of representational art.

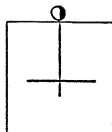
25. A method of designing a decorative unit comprising dividing a unitary ornamental design into separate portions with some of said portions being positioned within the closed border of a rectangular base having sides of equal length or multiples thereof or within a hexagonal base, disposing the said same portions of the design asymmetrically within the border of the unit with respect to the geometric center thereof, positioning the said portion with edges of equal width meeting the unit border and with the centers of said edges being positioned equidistantly from the border corners for square, rectangles, and hexagons and having their centers spaced equidistantly from the corners on the short sides of rectangles and a similar distance apart on the longer sides of the rectangles, coloring the portions with the same color characteristics, and disposing the portions within the unit border so that all of said portions combine with one another as the decorative units are joined to one another in combinations to form a variety of clearly distinctive patterns characteristic of representational art.



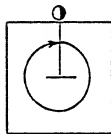
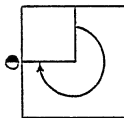
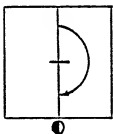
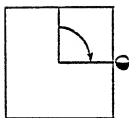
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FIG. 1FIG. 2.

-2-



"JACVAIS" unit.



Position 1.

|90°|

Position 2.

|180°|

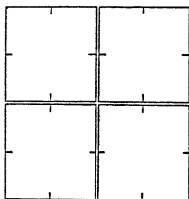
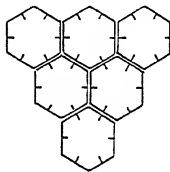
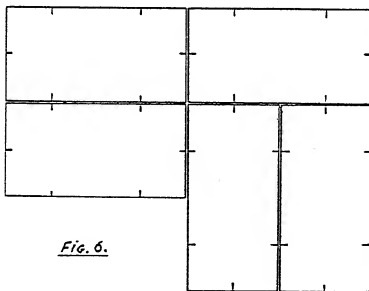
Position 3.

|270°|

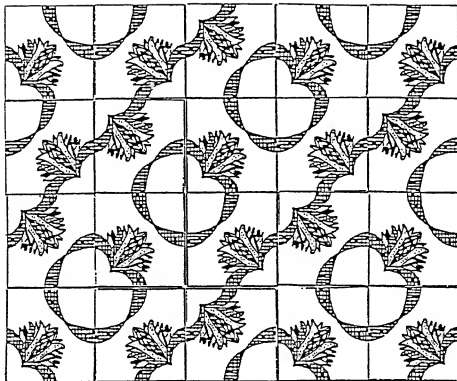
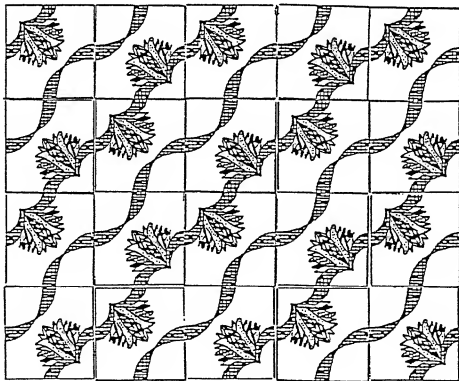
Position 4.

|360°|

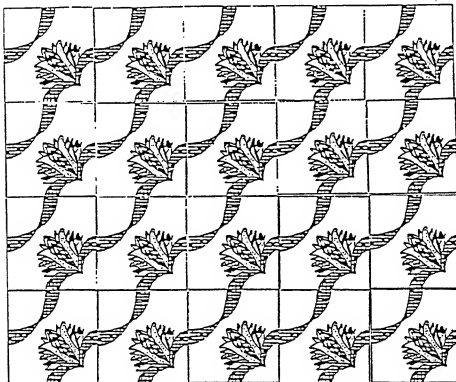
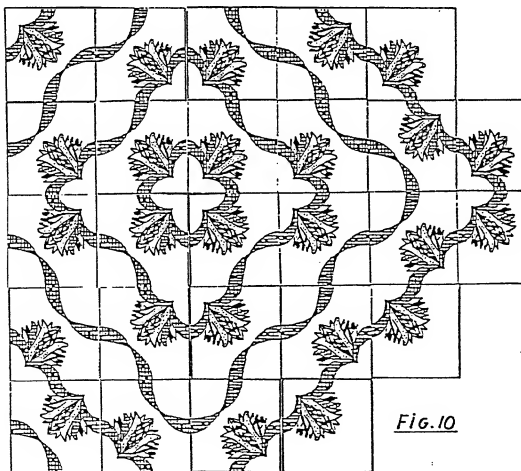
Fig. 3.

Fig. 4.Fig. 5.Fig. 6.

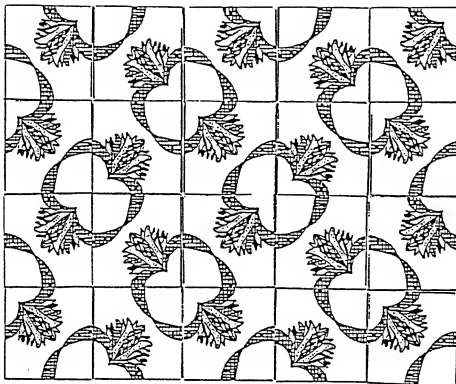
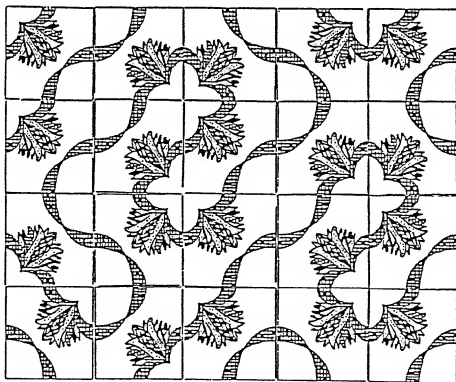
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Fig. 7Fig. 8

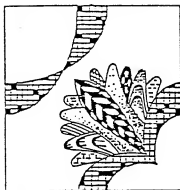
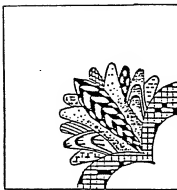
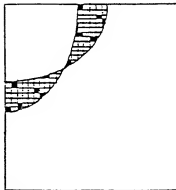
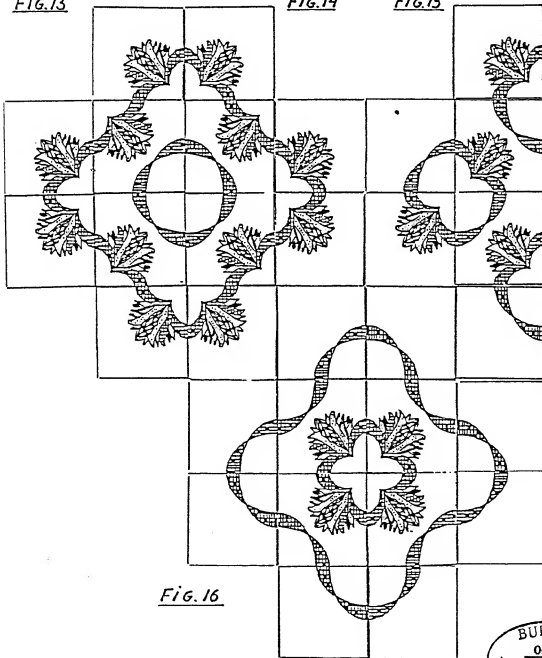
-5-

Fig. 9Fig. 10

-6-

Fig. 11Fig. 12

-7-

"JACVAIS" unitFig. 13subunitFig. 14subunitFig. 15Fig. 16

-8-

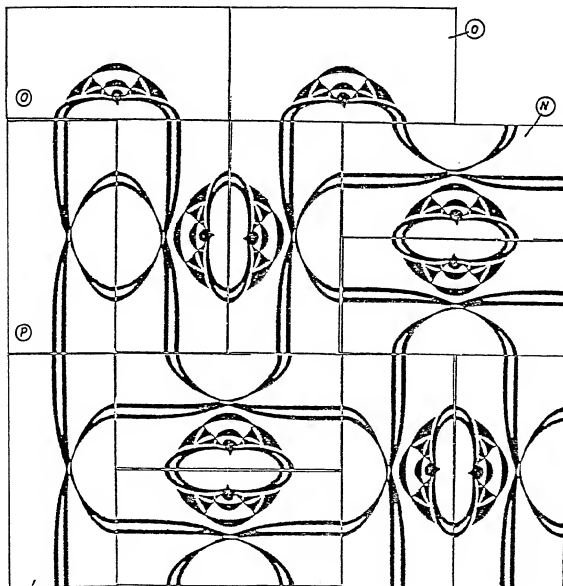
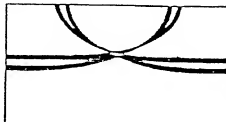
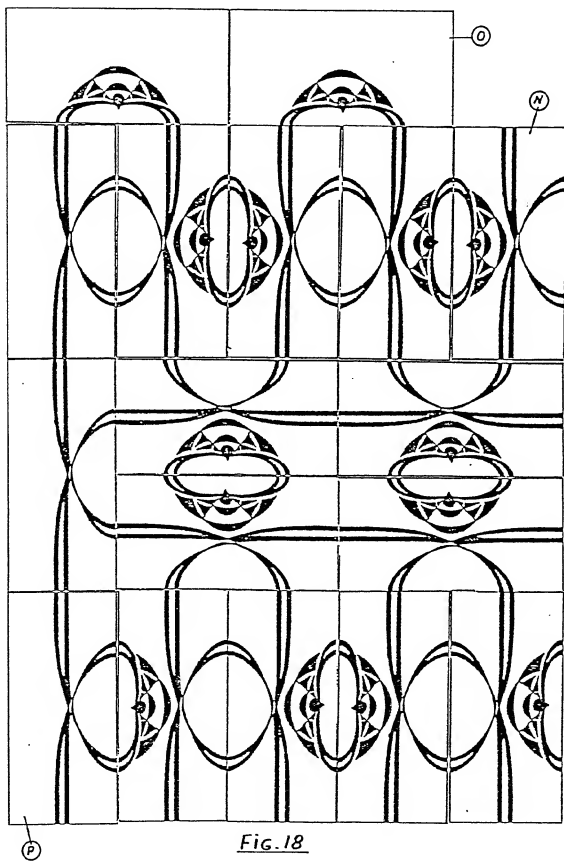
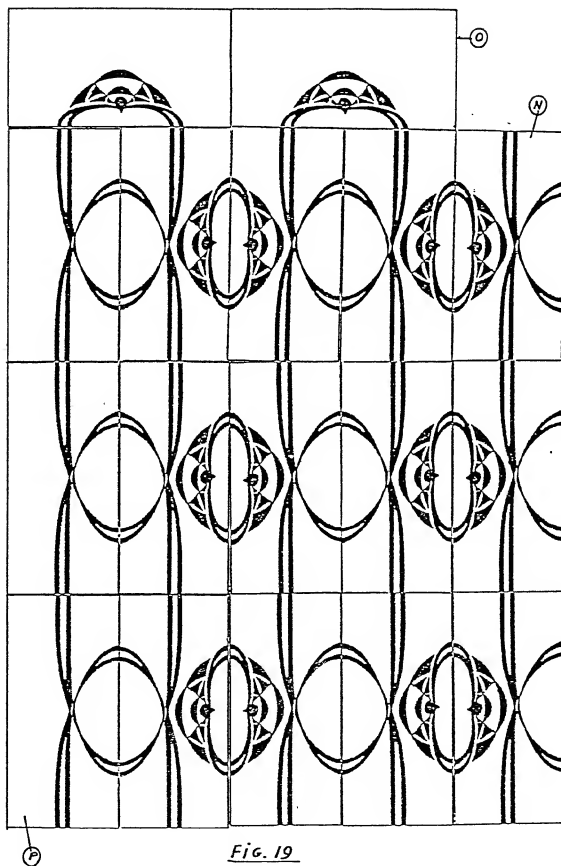
unit (N)subunit (O)subunit (P)

Fig. 17

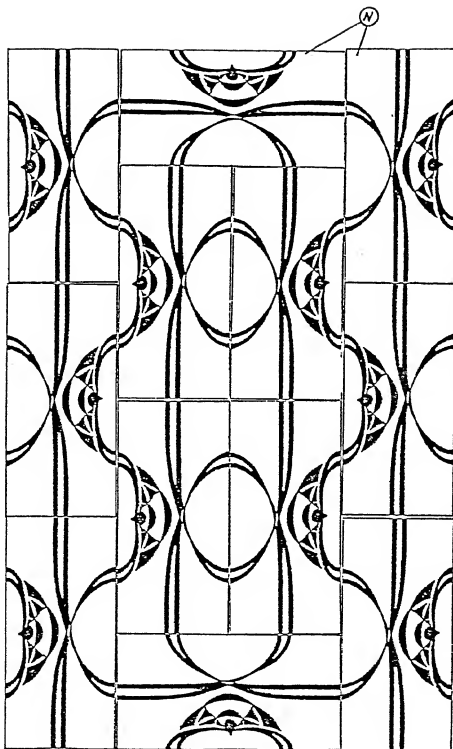
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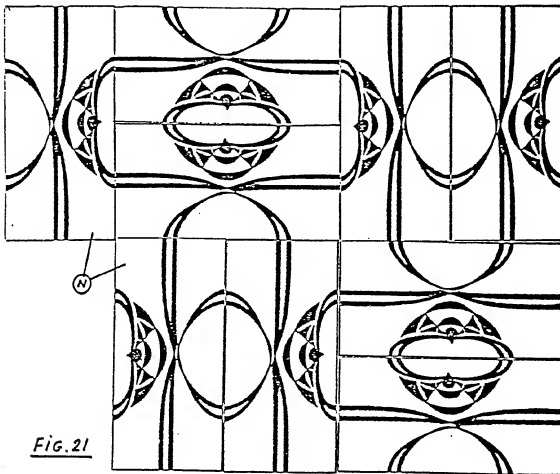
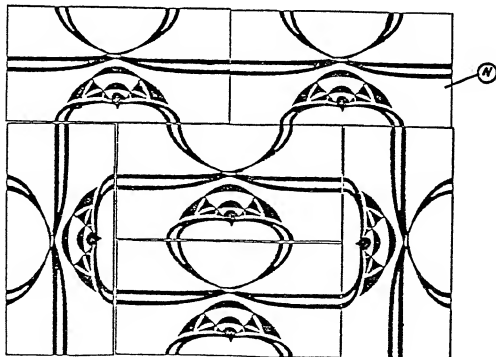
-10-

Fig. 19

-11-

Fig. 20

-12-

Fig. 21Fig. 22

INTERNATIONAL SEARCH REPORT

International Application No PCT/US 79/00058

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) *

According to International Patent Classification (IPC) or to both National Classification and IPC

INT. CL. B44C 1/28
U.S. CL. 428-80

W/ 79/00629

II. FIELDS SEARCHED

Minimum Documentation Searched *

Classification System

Classification Symbols

U.S. 156/63 428/47, 48, 49, 80
273/157R D25/93Documentation Searched other than Minimum Documentation
to the Extent that such Documents are Included in the Fields Searched *III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴

Category *	Citation of Document, ¹⁵ with Indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
X	US, A, 1,838,108, Published 29 DECEMBER 1931 RHODES, Page 2, lines 85-91	11, 12, 20
X	US, A, 2,114,474, Published 19 APRIL 1938 LABRA, Figure 1	4
X	US, A, 2,835,936, Published 27 MAY 1958 ELMENDORF, Column 2	2, 3
A	US, A, 3,002,309, Published 3 OCTOBER 1961 SNYDER	
A	US, A, 3,191,937, Published 29 JUNE 1965 KROPINSKI	
A	US, A, 3,242,594, Published 29 MARCH 1966 SMITH	
A	US, A, 3,247,299, Published 19 APRIL 1966 ZAHA	
X	US, A, 3,703,431, Published 21 NOVEMBER 1972 KEMPER	7, 17, 27
X	US, A, 3,875,716, Published 8 APRIL 1975 EUSEMANN, Columns 1 to 4	1-27

* Special categories of cited documents: ¹⁶

"A" document defining the general state of the art

"E" earlier document but published on or after the International filing date

"L" document cited for special reason other than those referred to in the other categories

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the International filing date but on or after the priority date claimed

"T" later document published on or after the International filing date or priority date and not in conflict with the application, but cited to understand the principle or theory underlying the invention

"X" document of particular relevance

IV. CERTIFICATION

Date of the Actual Completion of the International Search *

Date of Mailing of this International Search Report *

09 APRIL 1979

10 MAY 1979

International Searching Authority ¹Signature of Authorized Officer ¹⁰

ISA/US

HENRY F. EPSTEIN